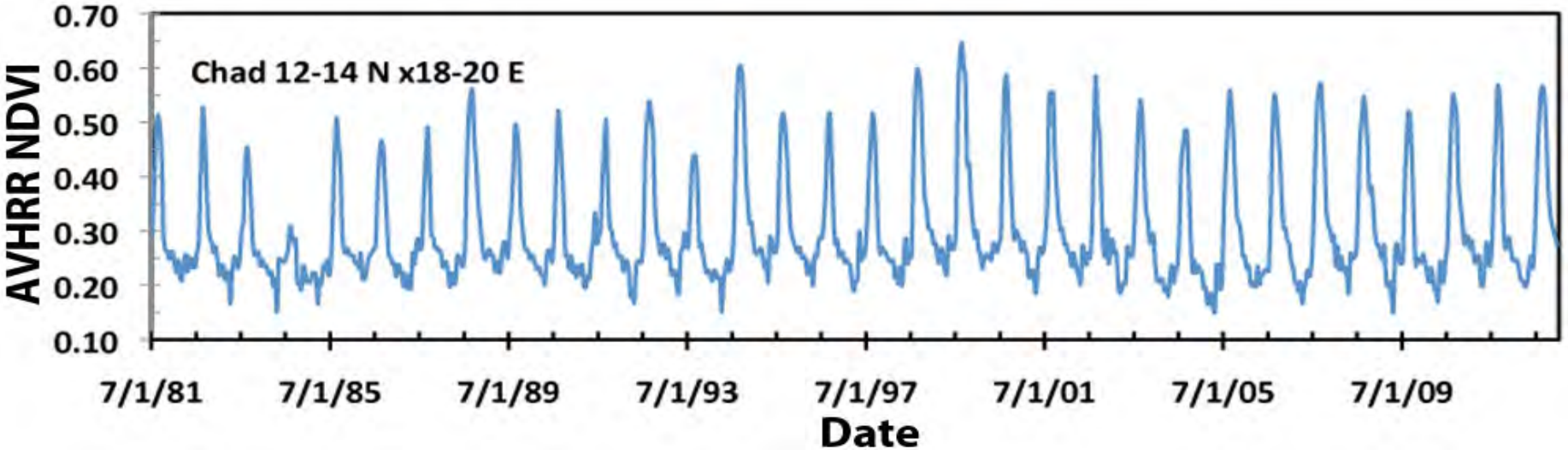
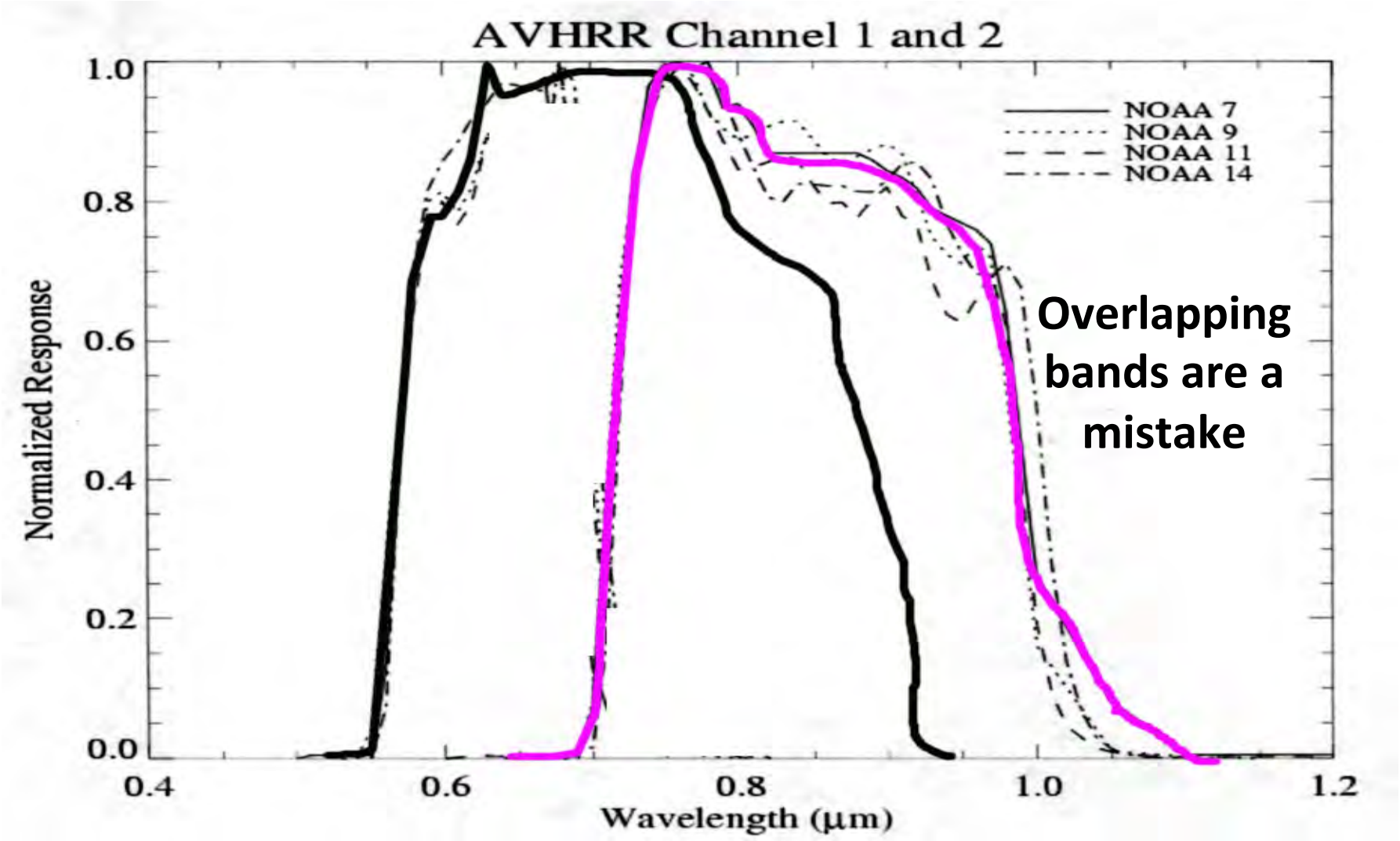
33 years of non-stationary global land photosynthetic capacity observations

Compton Tucker & Jorge Pinzon
NASA/GSFC



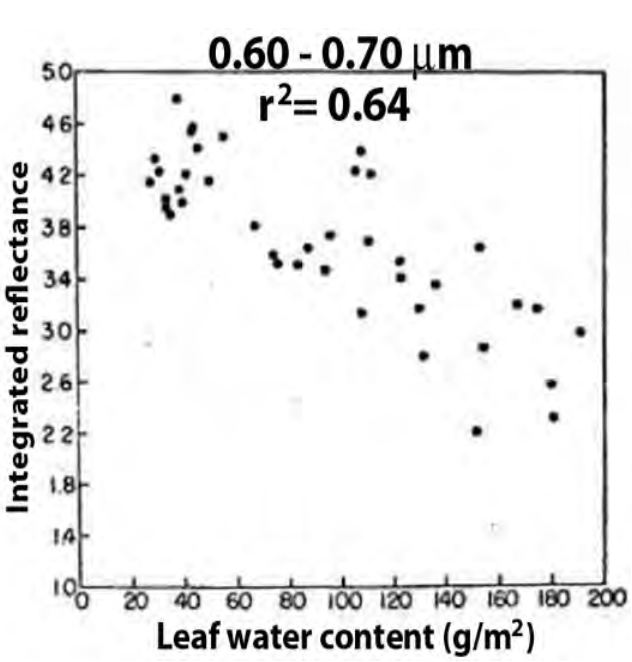
- Change AVHRR band 1 to only green & red regions
- Ground studies NDVI time series for biomass accumulation
- Transfer NDVI-biomass method to AVHRR data
- Produce satellite data sets for use by others

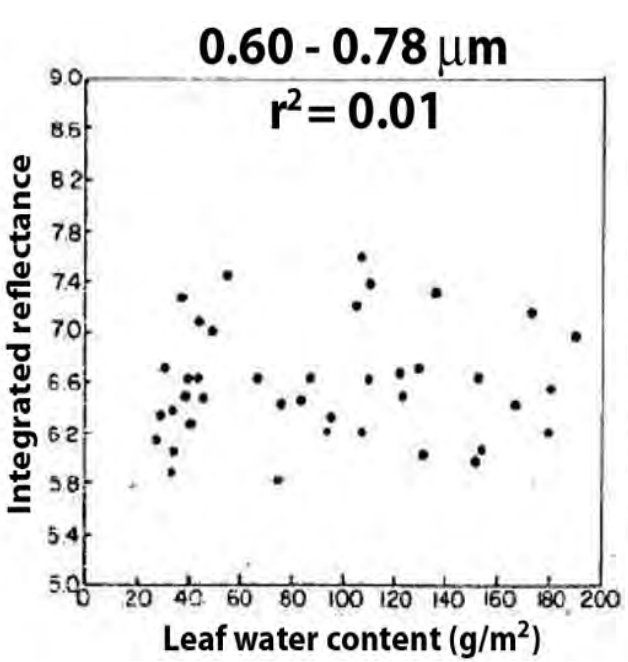
The TIROS-N AVHRR

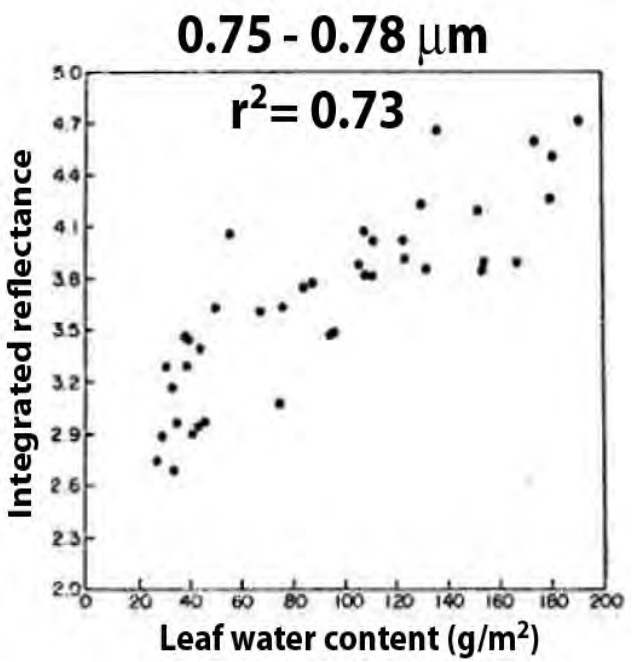


Bad Design for TIROS-N Channel 1

From my PhD dissertation Chapter 5 (1975) and Tucker and Maxwell 1976:

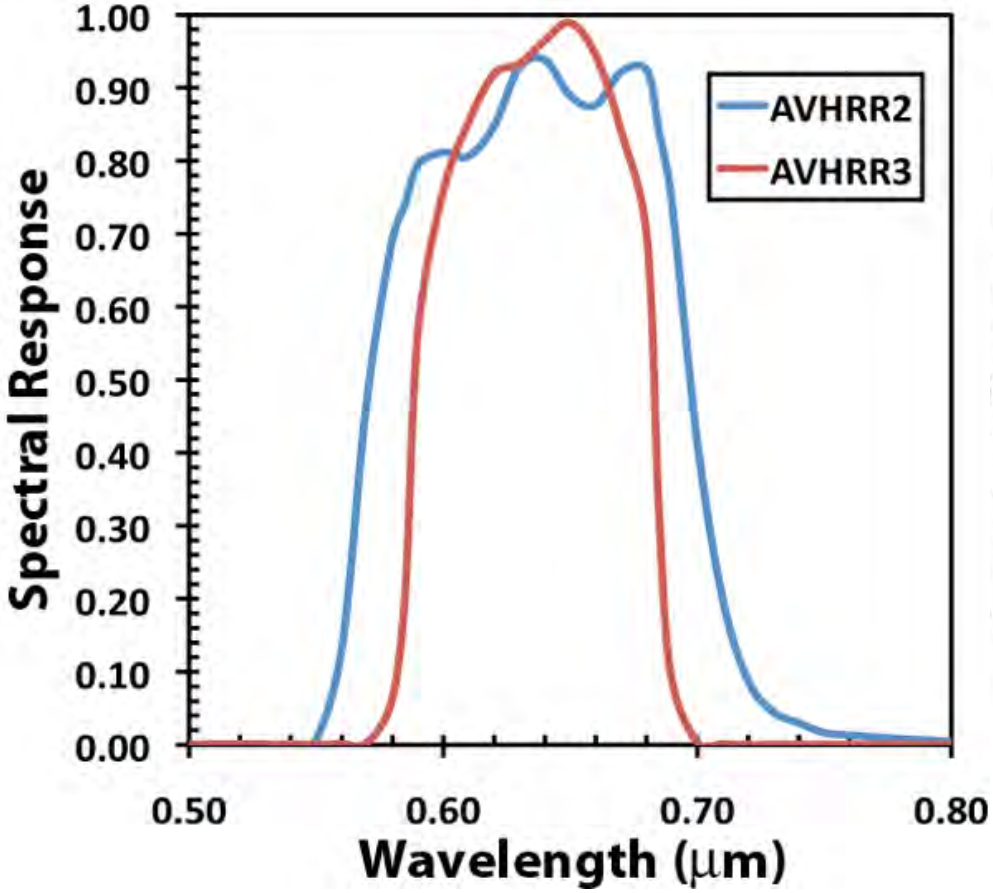


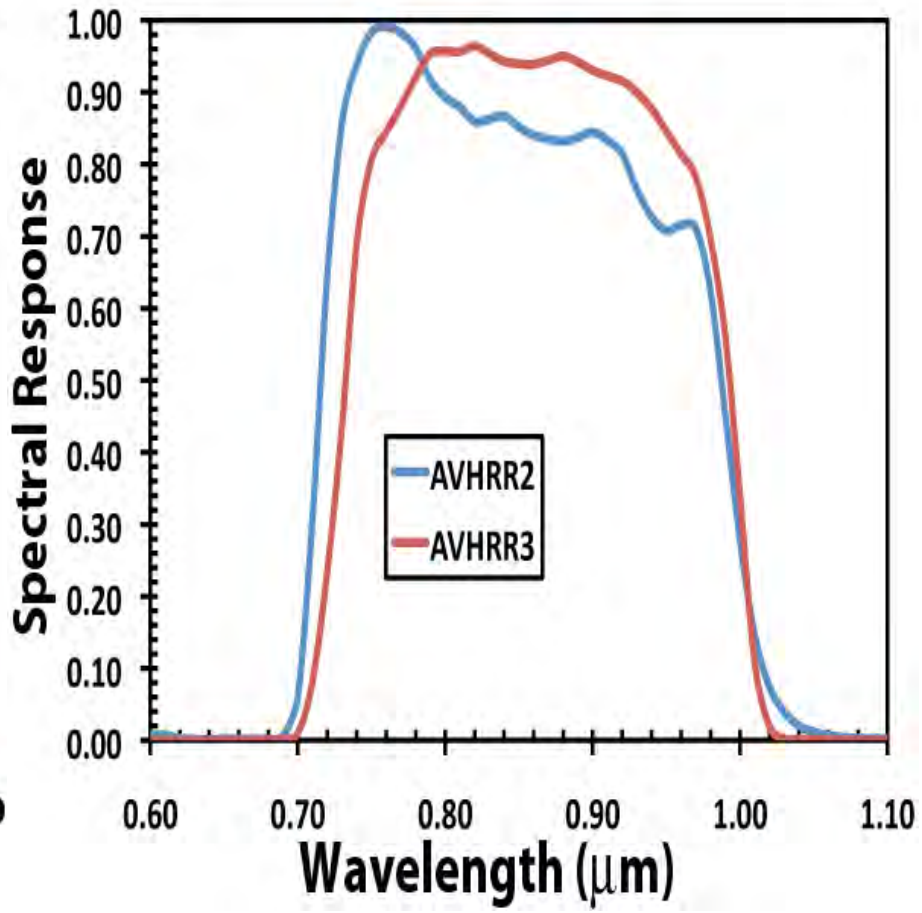




Working in 1976 with Stan Schneider and Dave McGinnis of NOAA/ NESDIS, AVHRR channel 1 was changed starting with NOAA-6

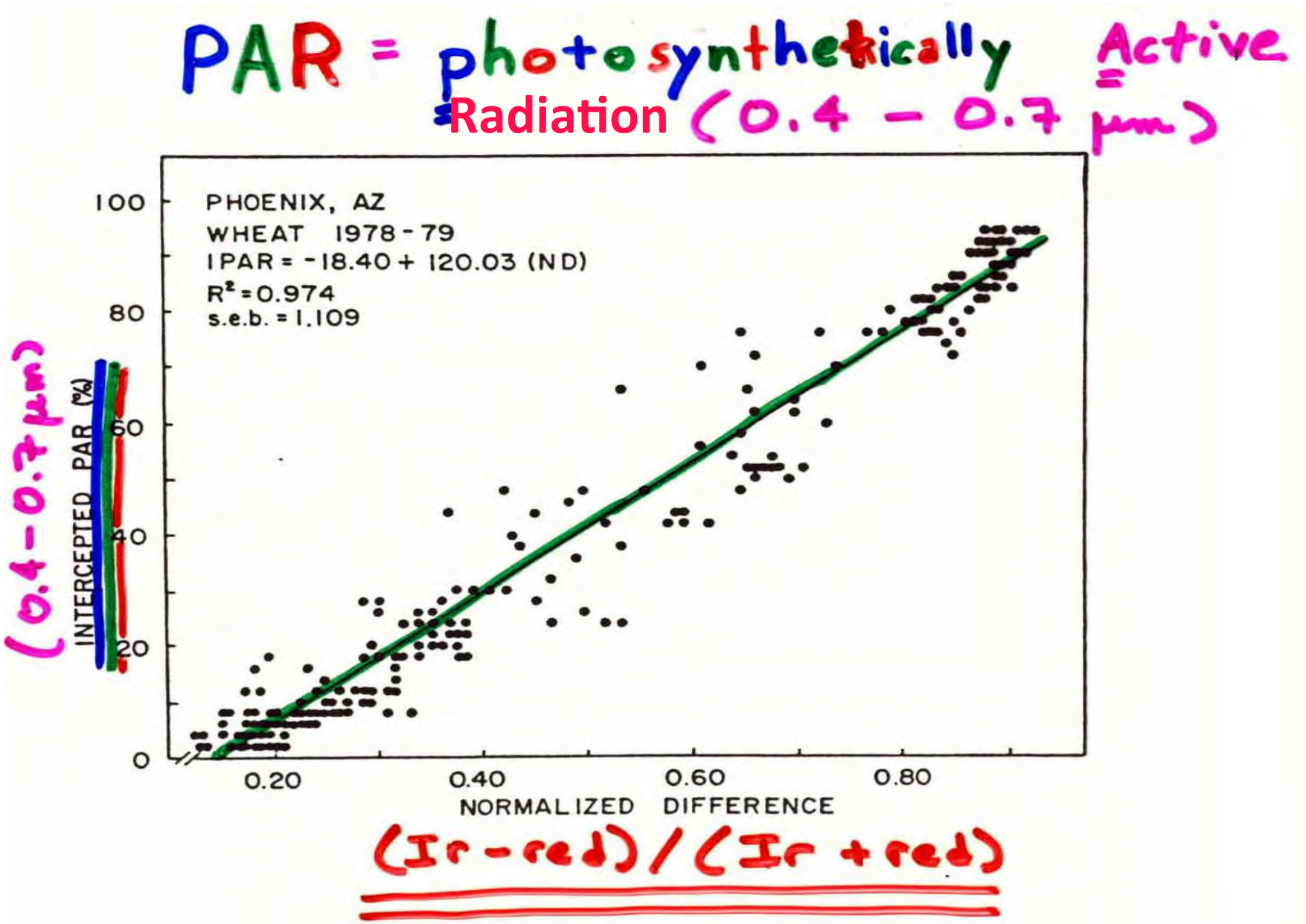
AVHRR Channels 1 & 2 Adjustments



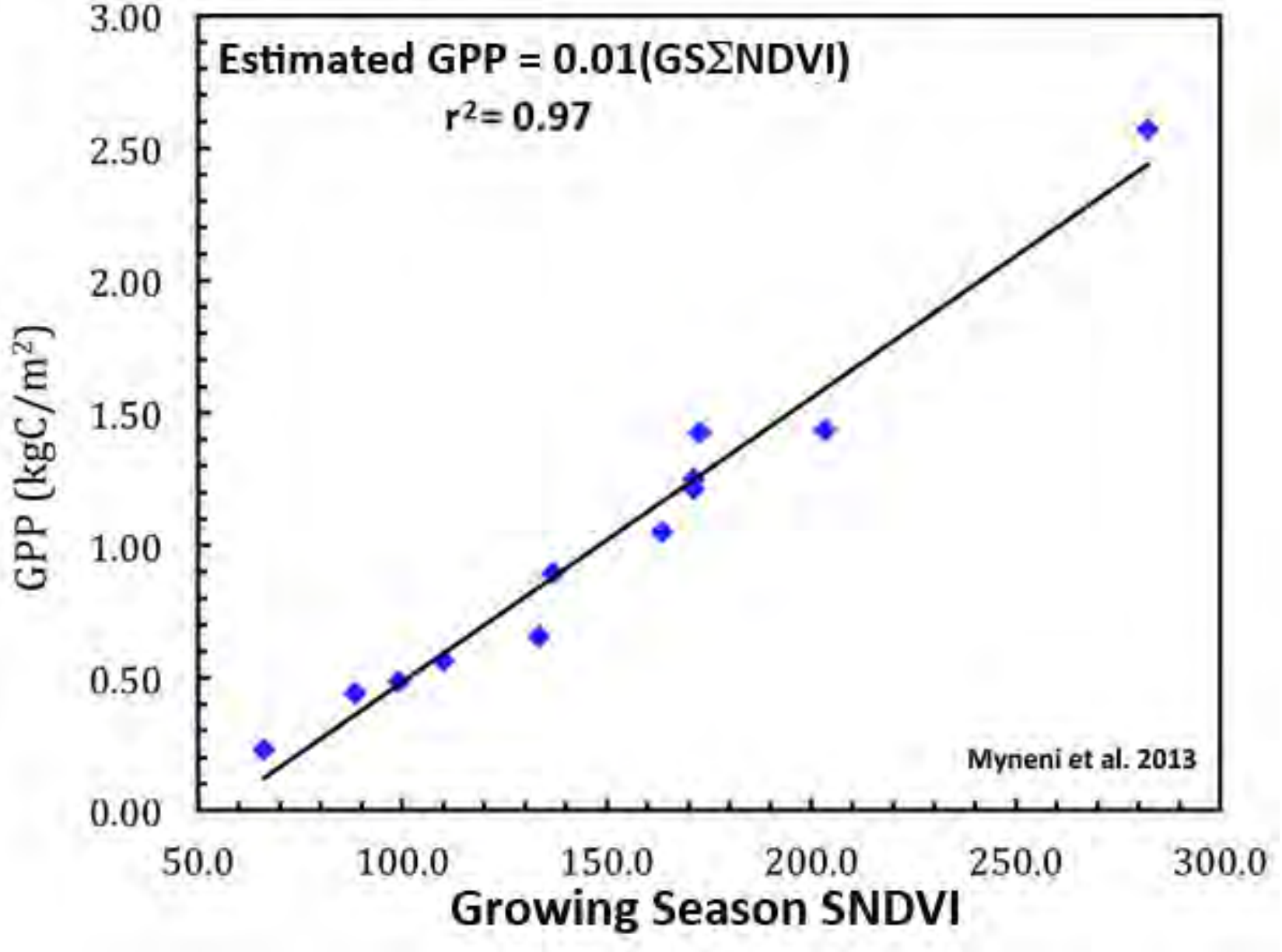


Beltsville USA winter wheat biomass

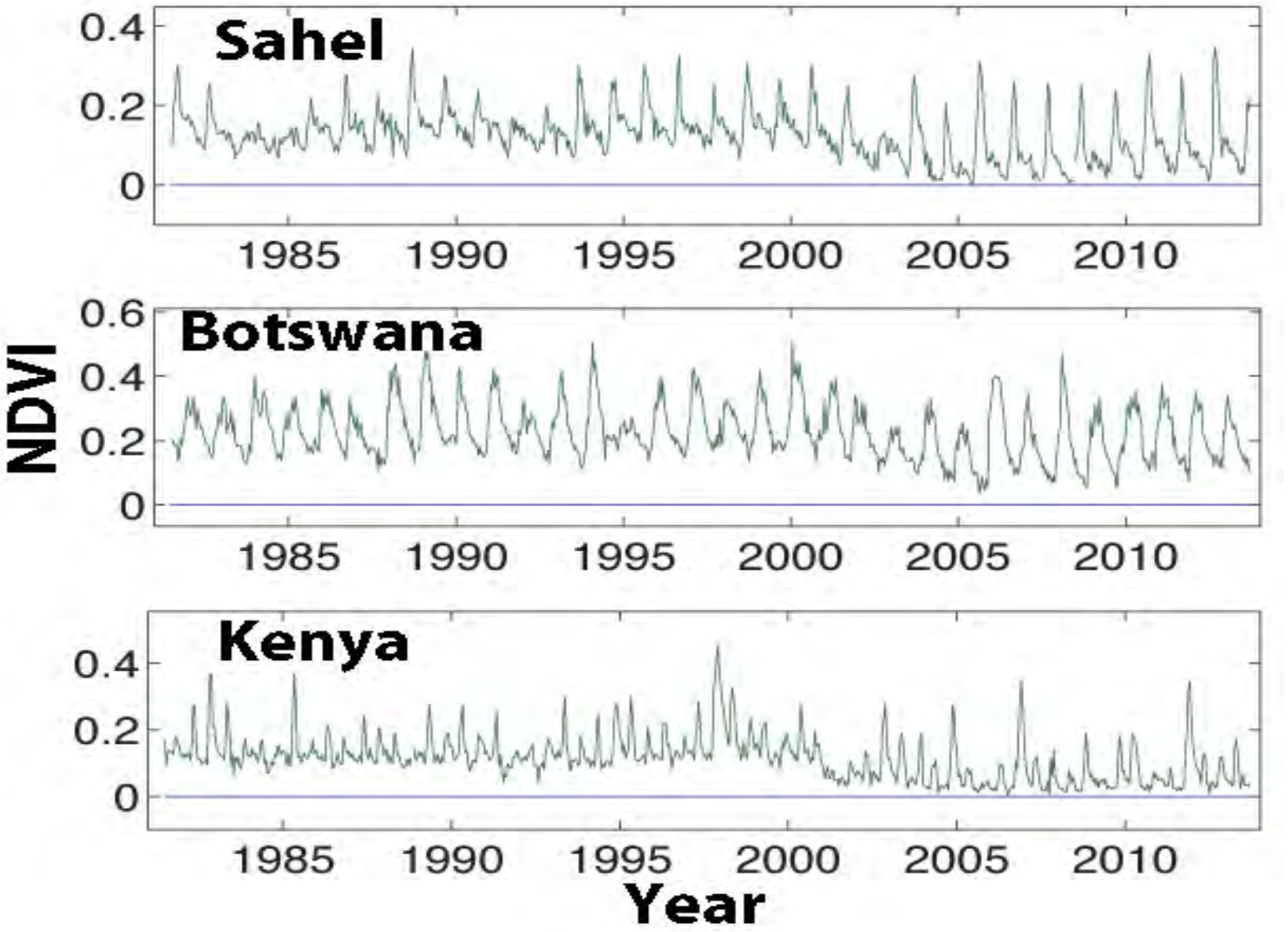
NOAA AVHRR 8-km NDVI Data Set



NDVI summed vs. flux tower GPP

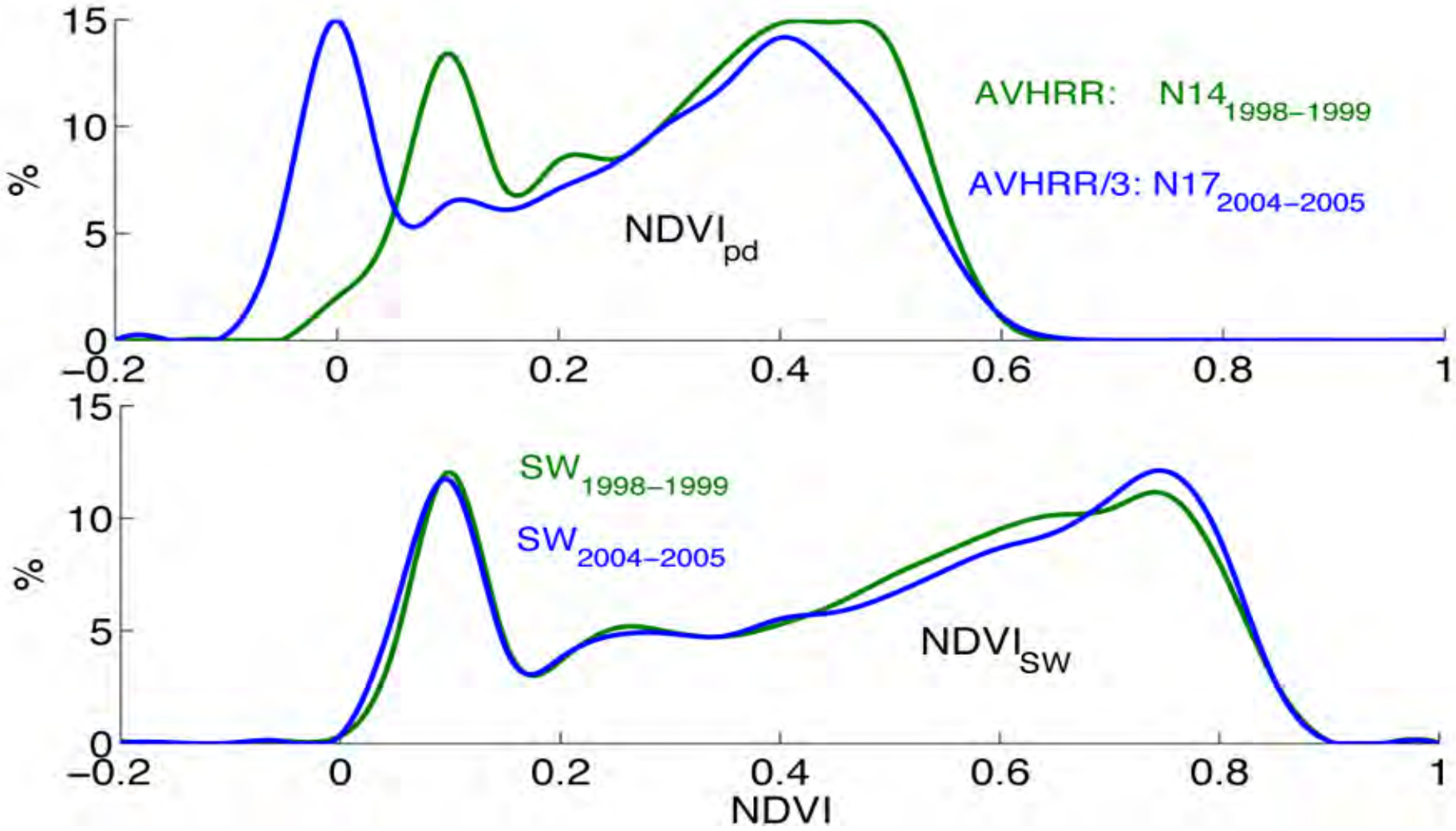


AVHRR 2/3 Dual Gain NDVI Adjustment

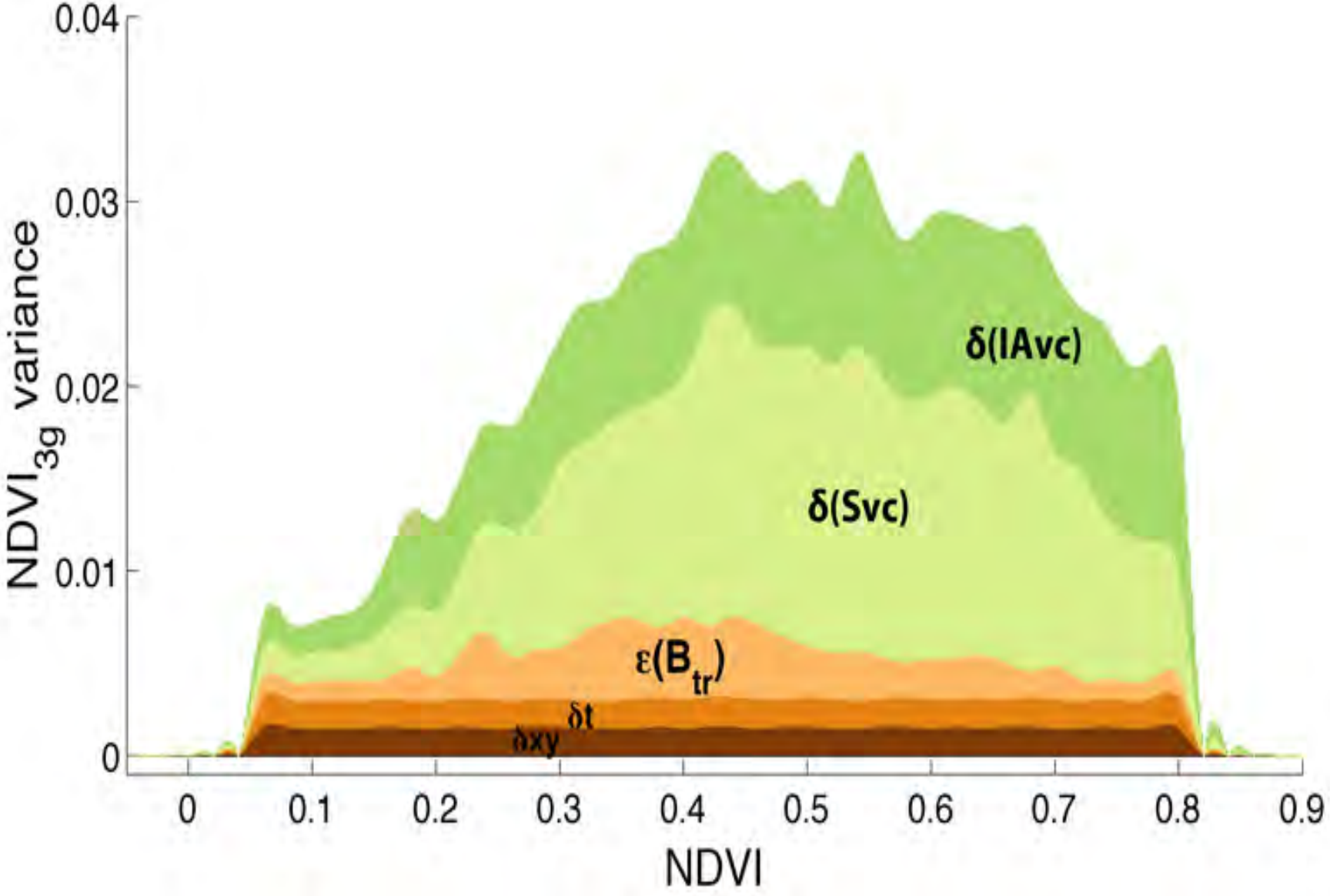


AVHRR 2/3 Dual Gain NDVI Adjustment

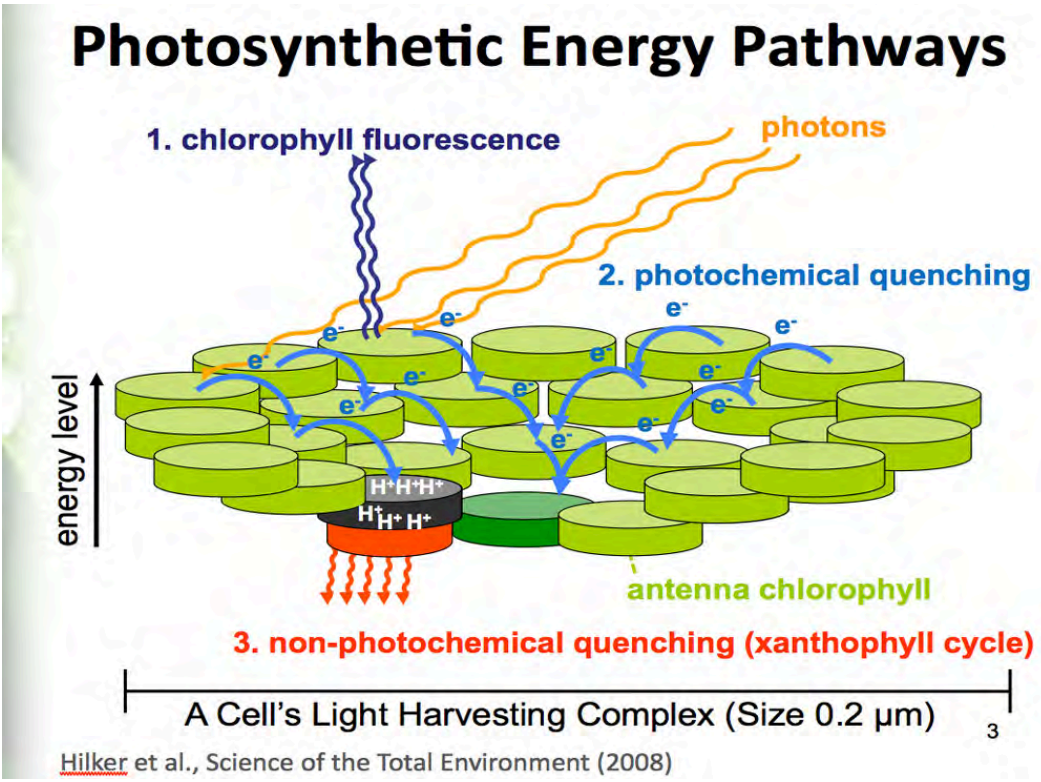
(Jorge Pinzon NASA/GSFC)

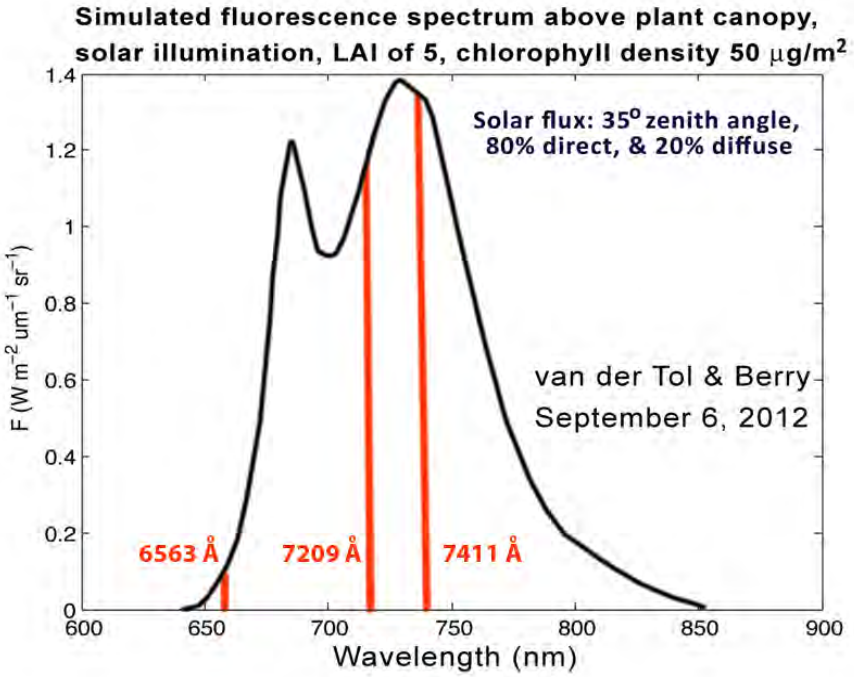


Variances in NDVI3g NDVI data

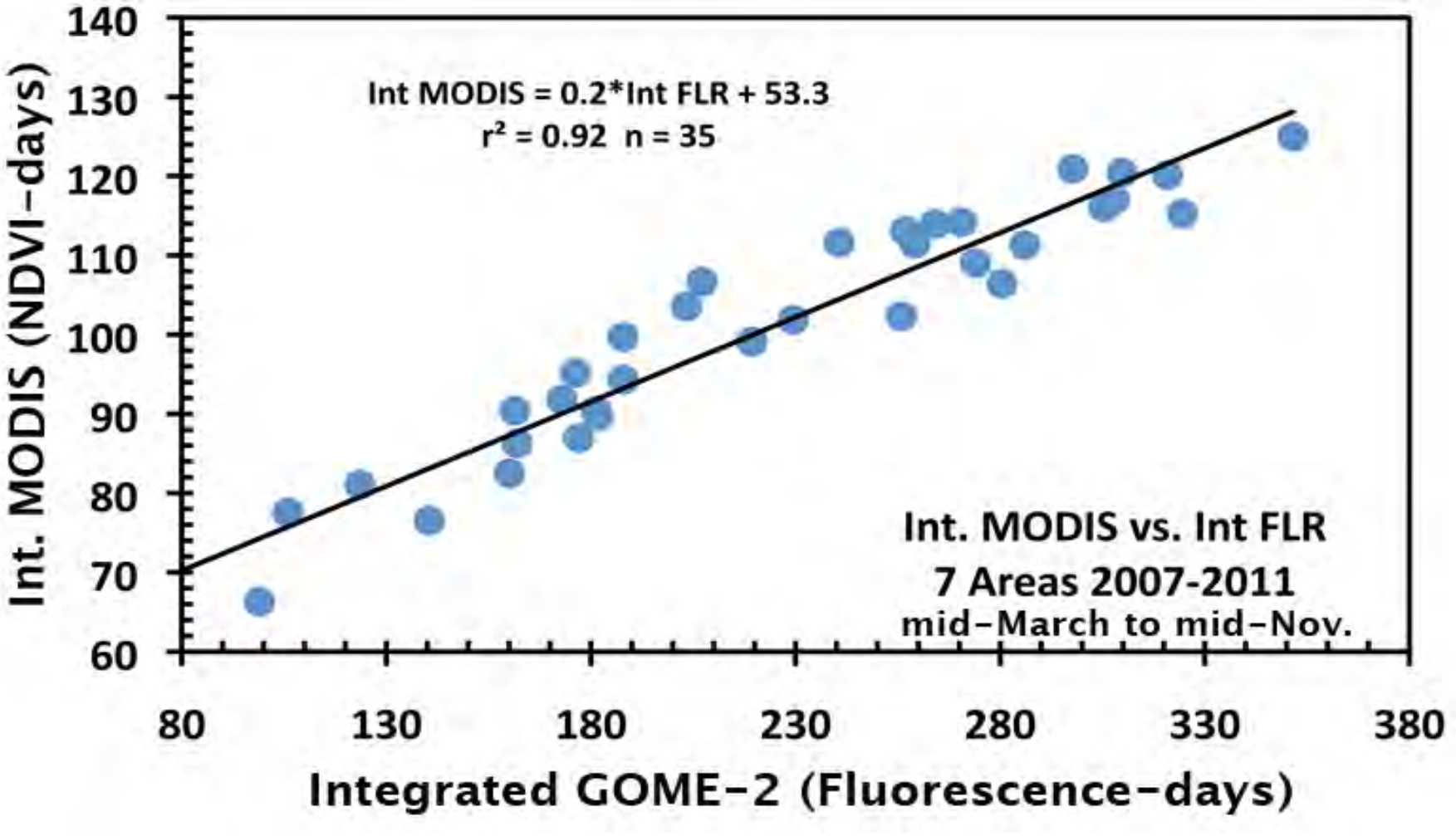


Photosynthesis, NDVI, & Fluorescence

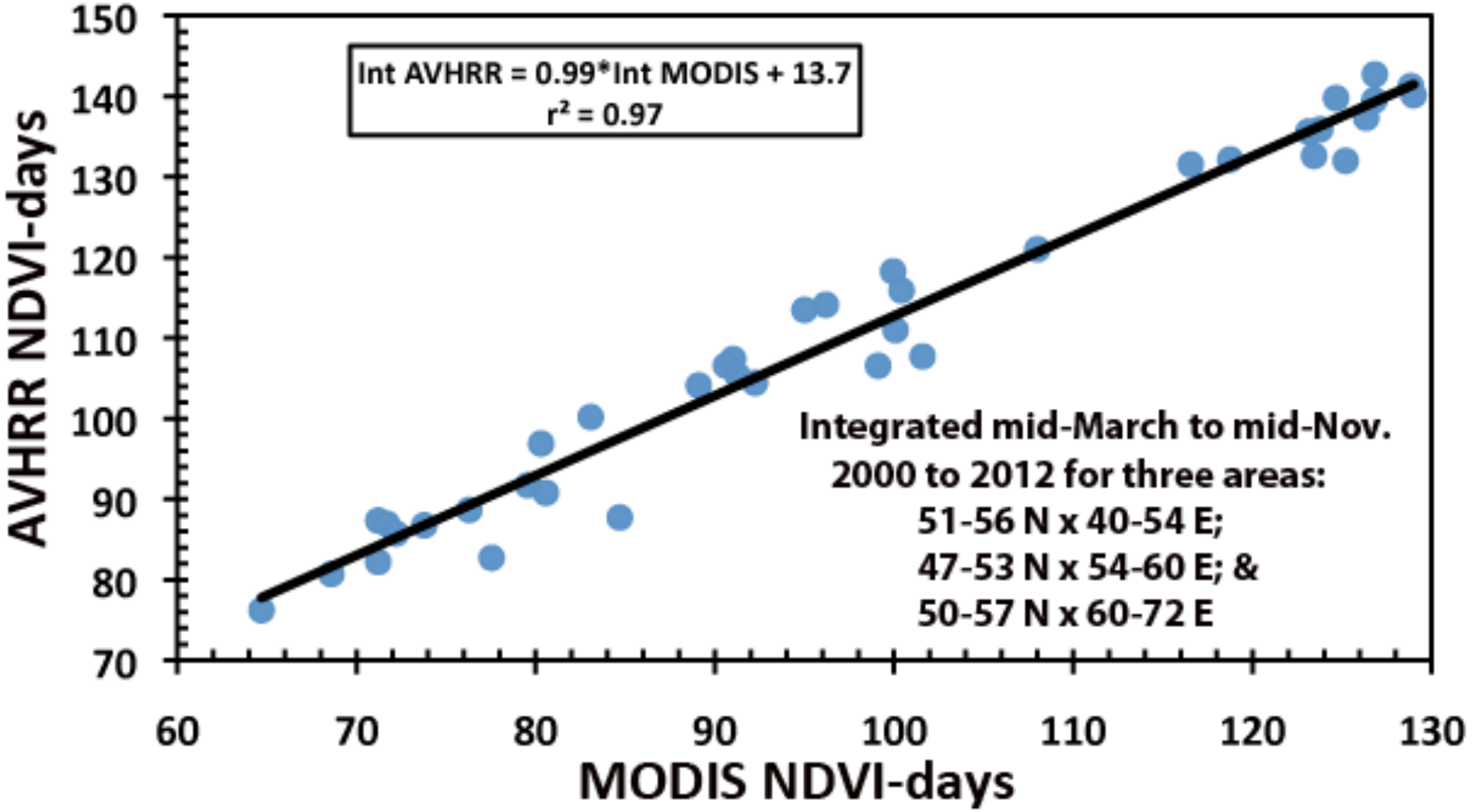




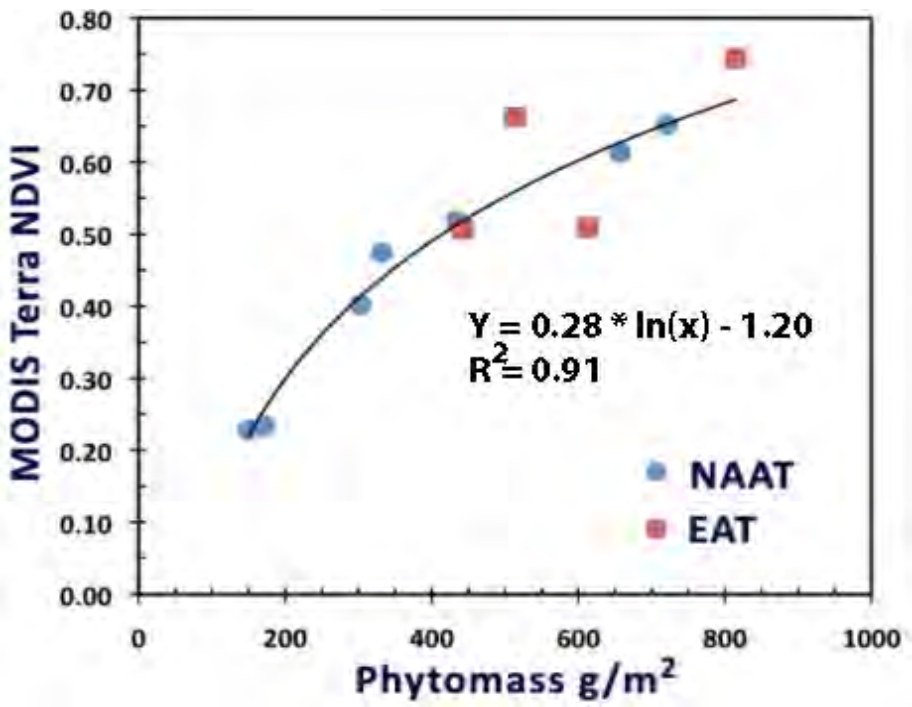
NDVI (potential) & Fluorescence (flux)

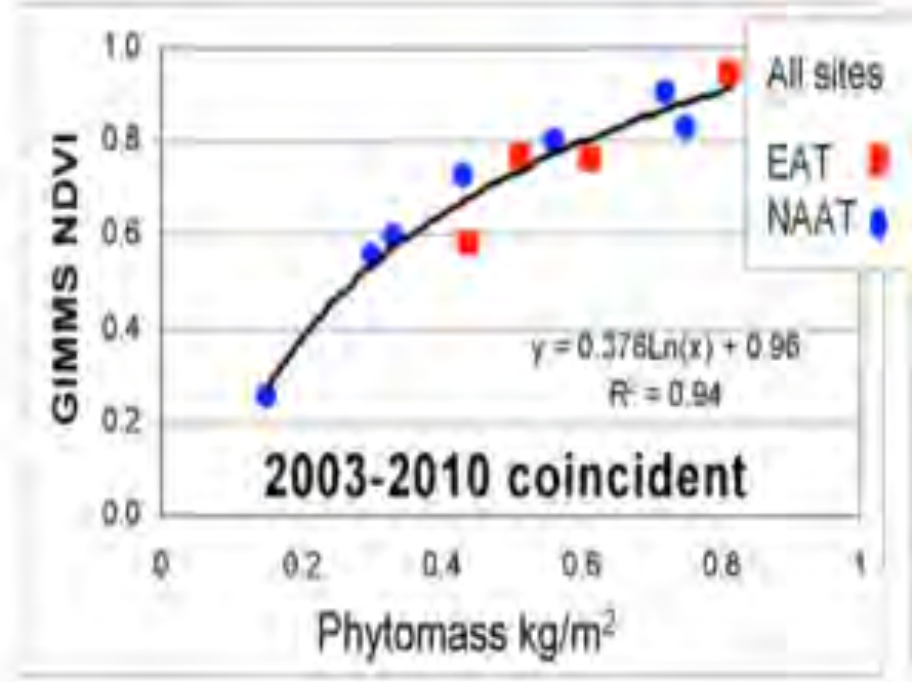


MODIS & AVHRR NDVI Comparisons



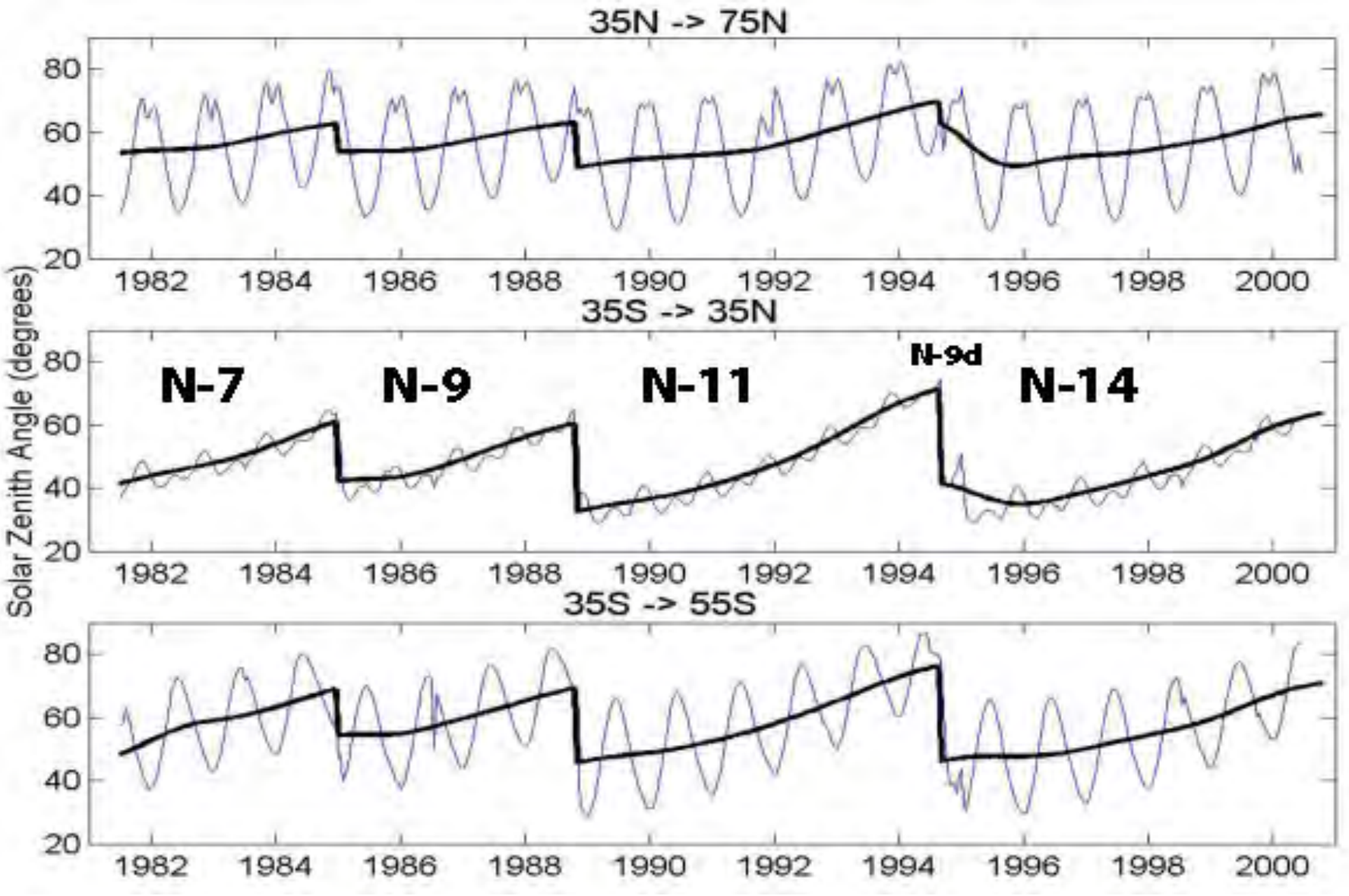
Arctic Tundra Biomass Comparison



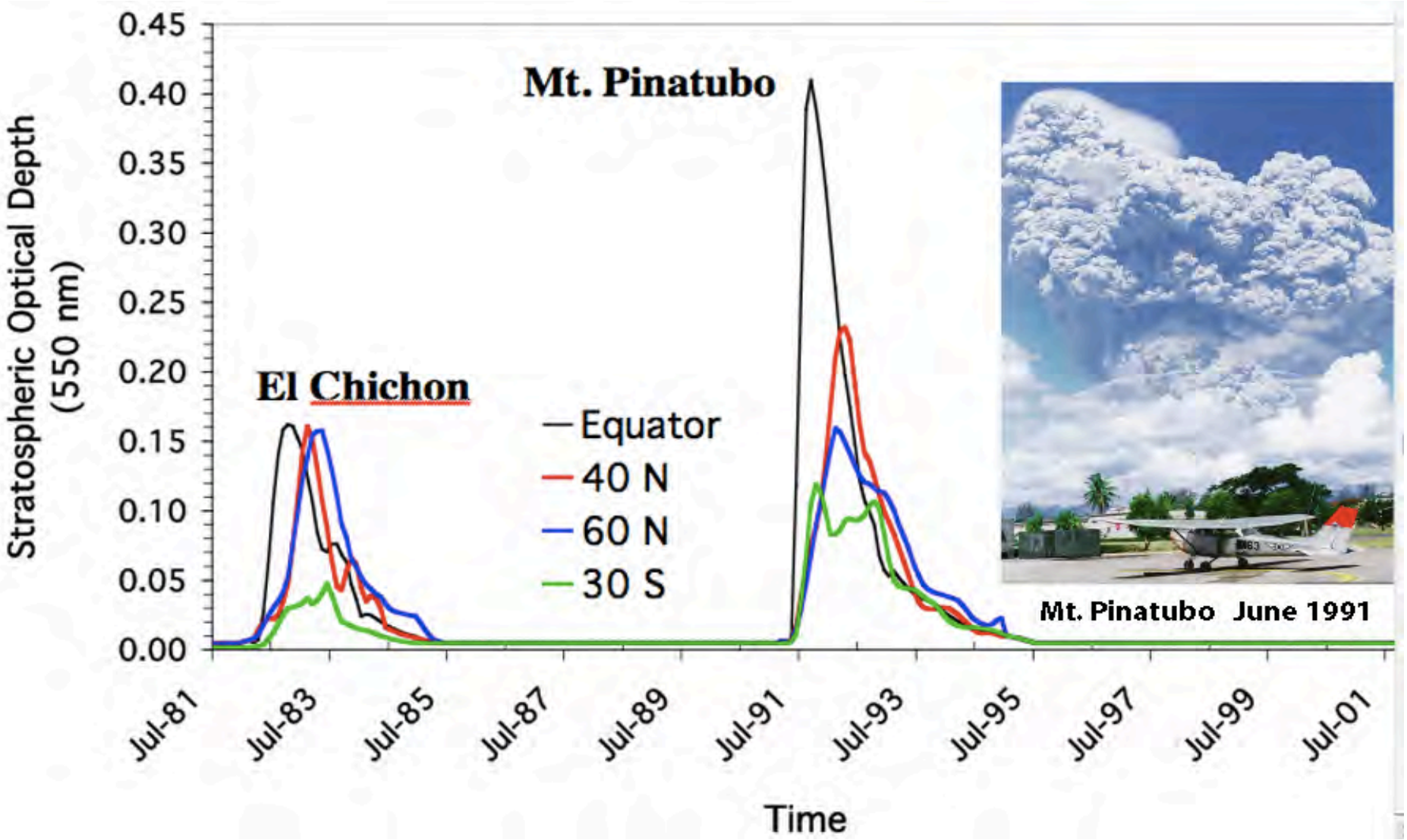


Average Tundra AVHRR & MODIS

Lack of Station Keeping—Orbital Drift

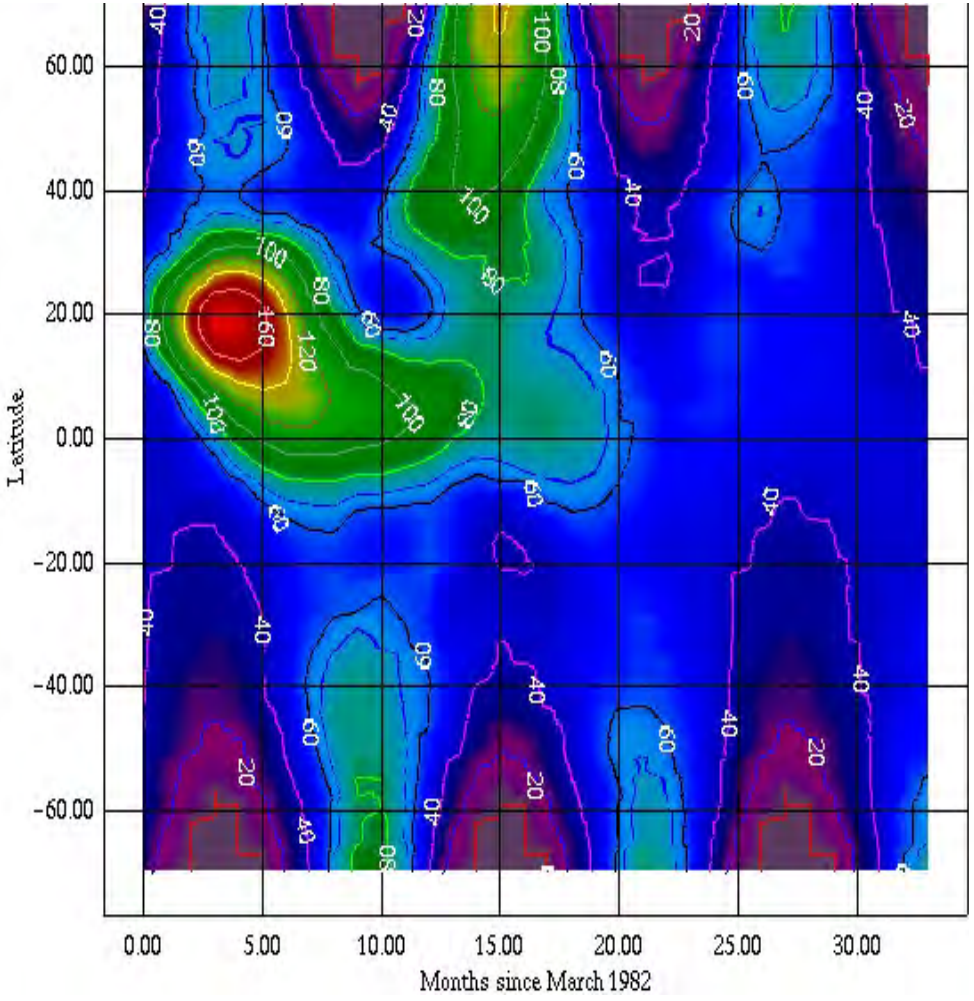


Two Volcanic Aerosol Periods

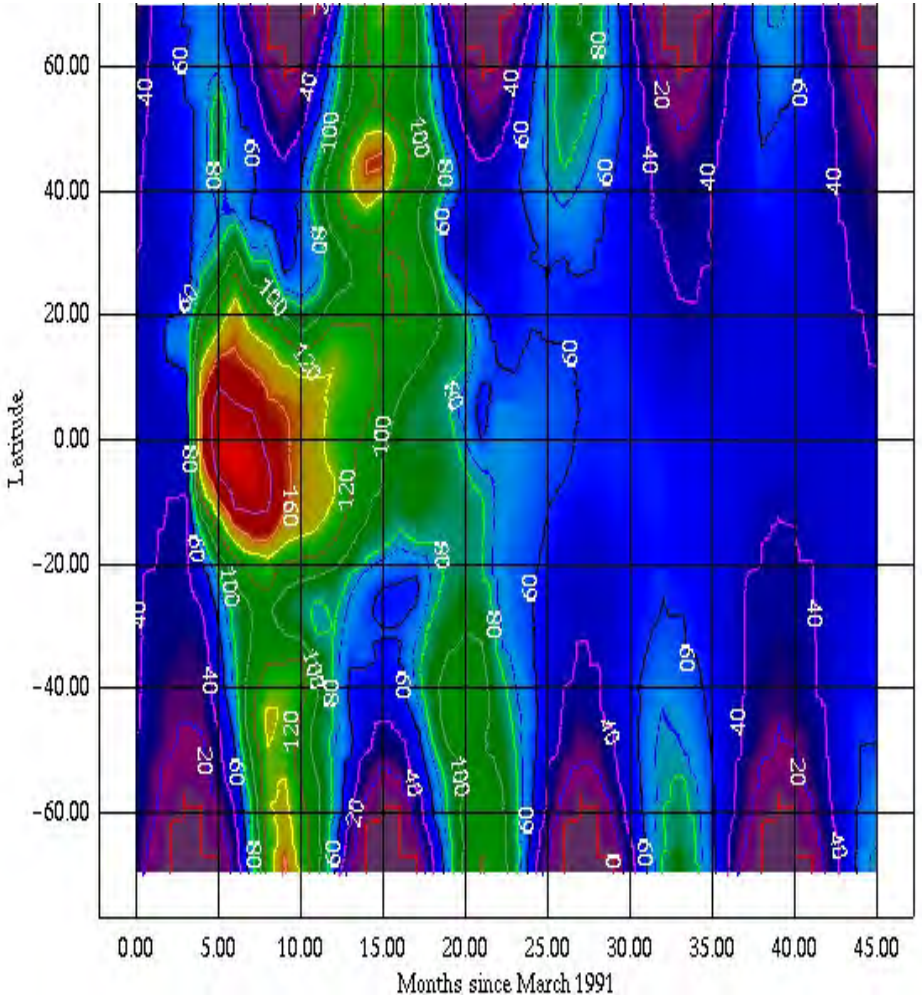


NOAA AVHRR 8-km NDVI Data Set

Diffuse average daily PAR[W/m2/mic] (0.4-0.7 mic)

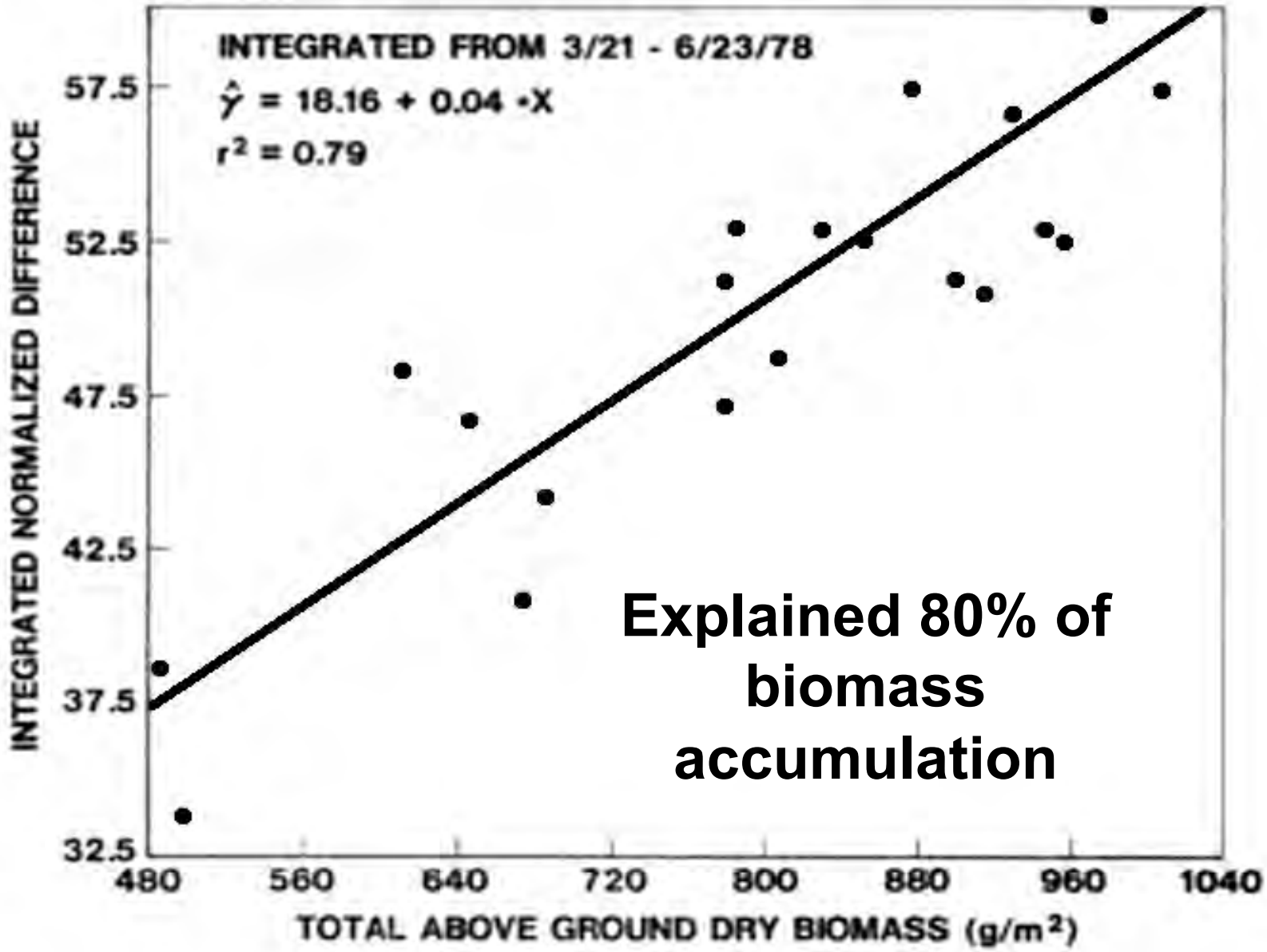


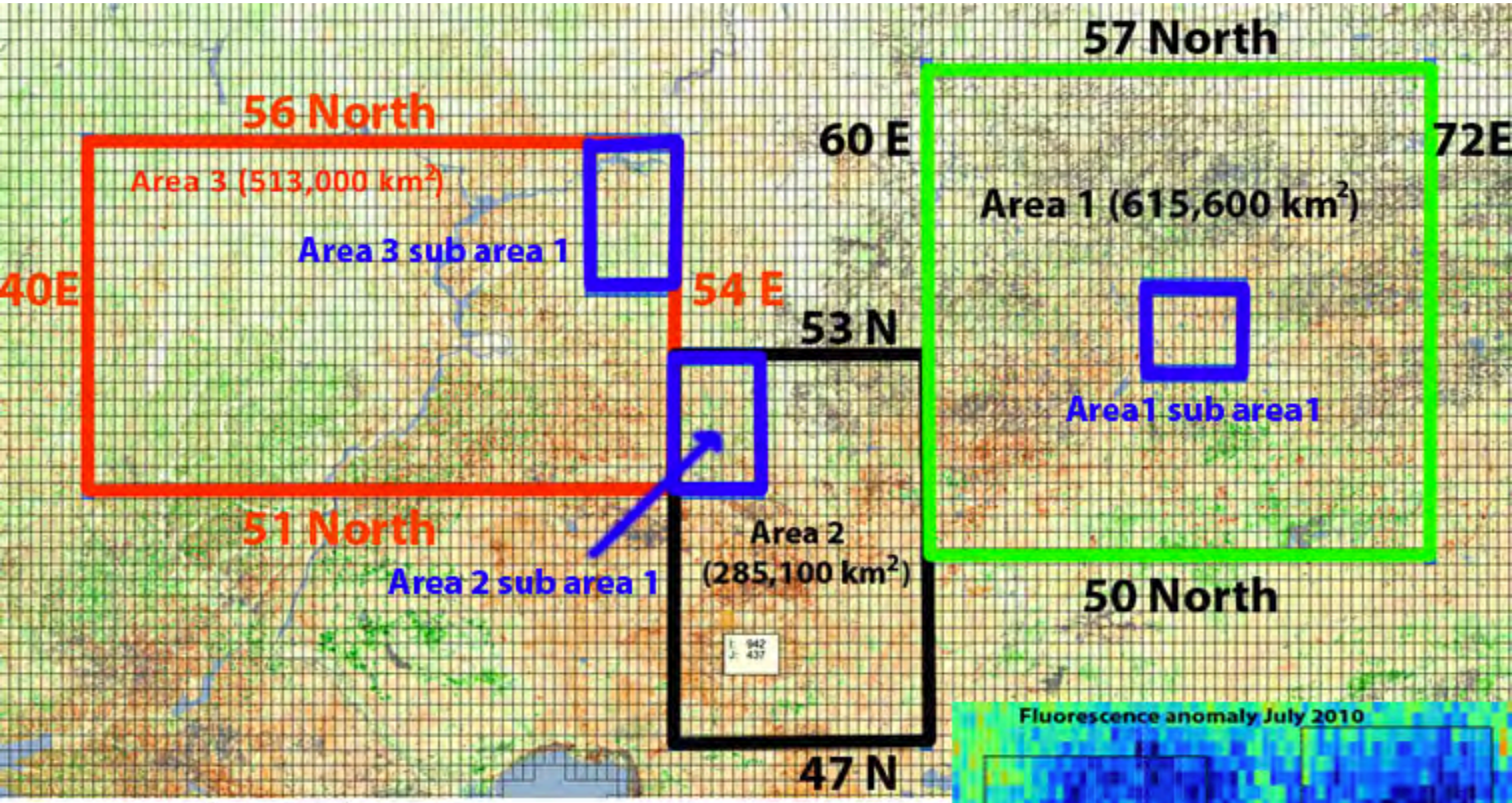
El Chichon (1982-1984)

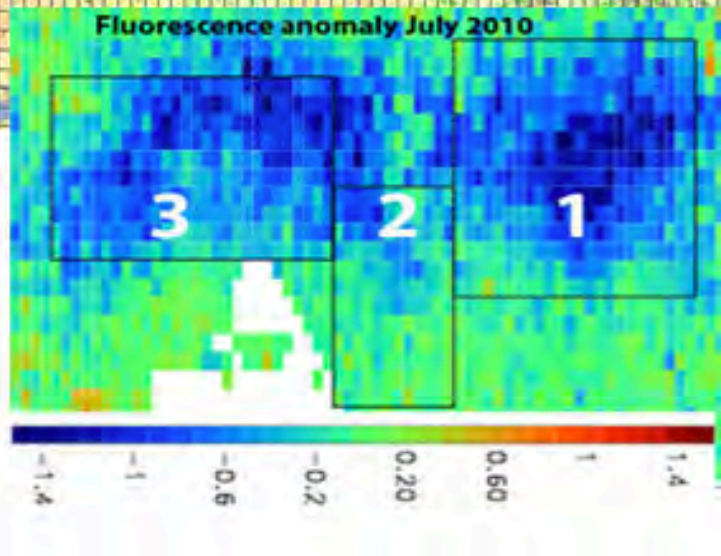


Mt. Pinatubo (1991-1994)

NDVI summed vs. total dry biomass







	km2	#pixels: Gome-2	AVHRR	MODIS
Area 1:	615,620	336	9.6k	12M
Area 2:	285,112	144	4.5k	5.7M
Area3:	513,017	280	8.1k	10M
A1sub1:	22,573	32	373	0.5M
A2sub1:	30,342	49	477	0.7M
A3sub1:	28,268	49	444	0.6M

Integration of NDVI Data